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Interprofessional Anatomy Education in the United Kingdom: Perspectives From Students and Teachers.

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ABSTRACT

There is increasing recognition of multi-professional learning in anatomy and its role in medical and healthcare professions. This study utilized two components to investigate anatomy interprofessional education (AIPE) in the United Kingdom and Ireland. Firstly, a survey involving qualitative and quantitative components asked Heads of Anatomy to report on their institutions' uptake of AIPE. Secondly, a series of case studies explored the experiences of students by using evaluation forms and an in-depth analysis of thematic concepts to understand the learners' perspectives on designing and delivering AIPE. Out of the 13 institutions that took part in the survey, eight did not offer an AIPE program. Between the remaining five institutions that deliver AIPE programs, ten different modules are offered with the majority involving healthcare professions. The AIPE component is rated highly by students. The themes from the case studies highlight how valuable AIPE is from the student perspective both in terms of engaging them in anatomy as well as in the broader skills of teamwork and communication. The case studies also revealed how AIPE can be engaging for groups of students who might not have previously had access to cadaveric anatomy, for example engineers and archeologists. The results of this study have implications for curriculum design in medicine and healthcare but also for further engagement of professional groups from non-healthcare backgrounds.

Keywords: gross anatomy education, medical education, health care students, interprofessional learning, multiprofessional learning, interprofessional education, nursing education.

INTRODUCTION

In the healthcare domain, understanding the human body is imperative and anatomy is a staple component of the curriculum (Heylings, 2002). Many non-healthcare related disciplines also have an interest in anatomy; for example archeology, anthropology, art and humanities. Historically, medical students have traditionally had the most time devoted to the study of anatomy and the greatest access to dissection and practical-based anatomy material (Drake et al., 2009).

Interprofessional Education

Interprofessional education (IPE), synonymous with interprofessional learning (IPL), is defined as two professional groups integrating in a learning environment. Multiprofessional education (MPE) or multiprofessional learning (MLP) is defined as three or more professional groups bringing their expertise to the same problem (Parsell and Bligh, 1998). Interprofessional education aims to: improve the quality of care, health outcomes and patient wellbeing (CAPIE, 2002). Four key elements have been identified in interprofessional learning: goals, roles, procedures, and interpersonal issues (GRPI) (Rubin and Beckhard, 1972). The GRPI elements have become well established within healthcare professional teams and IPE (Hamilton et al., 2008).

Anatomy and Interprofessional Education

Several studies have explored AIPE with particular focus on the student learning experience (Mitchell et al., 2004; Hamilton et al., 2008; Krause et al., 2014; Herrman et al., 2015; Kirch and Ast, 2015; Shield et al., 2015). The reported methods of teaching

AIPE vary, with some institutions adopting a demonstrator-led dissection session (Herrman et al., 2014), and others using a mixture of dissection and problem-based learning (PBL) (Fernandes et al., 2015). It has also been reported that AIPE can be delivered as a near-peer teaching session (Shields et al., 2015).

A consideration for designing successful AIPE sessions is the learning environment, especially those IPE programs that include a practical laboratory-based session utilizing human cadaveric material (Mitchell et al., 2004). For example, the sights of the dissecting room proved to be problematic for radiography and nursing students, but for physiotherapy students it was the smell that was more disconcerting (Mitchell et al., 2004). It is important to understand how these different experiences influence learning, and by reflecting on the student's perceptions of anatomy, teachers can begin to influence a student's approach to learning. It has been demonstrated that concern over the dissecting room environment is associated with negative perceptions of learning anatomy (Horne et al., 1990; Nnodim, 1996, Smith et al., 2014). This can lead to adopting a surface approach towards learning, which in turn may cause the student to struggle in the future when applying their knowledge (Smith and Mathias, 2010; 2011). However, because the Smith and Mathias studies were based on medical students it could be argued that different professional groups might not experience the same issues. A subsequent study (Smith et al., 2014) comparing the approach to learning anatomy between dental, medical and speech science students found similar trends which confirmed that some characteristics of learning anatomy, such as the link between using cadavers and a deep learning approach, are inherent to anatomy

education rather than to a particular professional group. The AIPE study of Mitchell et al. (2004) found that nursing students both found the sight of dissection difficult as well as obtaining the lowest assessment scores in anatomy reflecting the possible relationship between negative perceptions and performance.

Understanding student perceptions is critical to understanding students' readiness for IPE. Parsell and Bligh (1999) developed a questionnaire called Readiness for Interprofessional Learning Scales (RIPLS), which when delivered revealed that students felt that shared learning was useful and that patients would ultimately benefit. The scales explored students' roles and identities and noted the shift from doctor as the team leader to the notion that leadership was dependent on context at the point of care (Reid and David, 1994). There are similarities with learning anatomy, for example, a member of the student team may be required to demonstrate leadership: uncovering the cadaver, locating specific structures. In addition to leadership skills, anatomy learning can also foster teamwork, communication skills, professionalism and respect (Escobar-Poni and Poni, 2006). When a study applied the RIPLS questionnaire to AIPE at Mayo Clinic, 92% of students agreed that IPE would help them become a more effective member of the healthcare team. Differences in attitude were revealed when comparing medical students with physical therapy students (Hamilton et al., 2008), with the latter group reporting that an interdisciplinary approach was not as necessary. In another study the same RIPLS questionnaire also demonstrated differences in that nursing students were more skeptical before the AIPE component (Herrmann et al., 2015). In a study by Fernandes et al. (2015) the RIPLS questionnaire demonstrated several

subscale changes on teamwork and collaboration, positive professional identity, and roles and responsibilities.

Combining AIPE and near-peer teaching has been highly rated by first year medical students (Shields et al., 2015; Fernandes, 2015). Krause et al. (2014) also describes physical therapy students successfully leading the teaching of the musculoskeletal system to an AIPE group involving medical students. These examples highlight a combination of two relatively recent concepts in pedagogy and illustrate that AIPE does not need to be confined to delivery by faculty.

Aside from learning anatomy, IPE has facilitated the fostering of collaborative working, shared learning, respect, team building, communication skills and understanding of different professional roles (Fernandez et al., 2015). In a training ward environment as described by Reeves et al. (2002) and later by Mackenzie et al. (2007) students can mimic future roles and situations. The anatomy environment with its 'donors as patients' offers an opportunity for students to develop these additional skills early in training. The benefits of team building in AIPE, highlighted in Thistlewaite (2015) can be further broken down into different competencies: understanding the development of effective teams, managing disagreements, sharing accountability, and reflection (IPEC Expert Panel, 2011). For those that do offer an IPE component there remains questions over its effectiveness. Interprofessional education effectiveness is dependent on a number of factors including: timing, length of study, pedagogical methods and the number and type of students involved (Thistlethwaite and Dallest, 2014). Interestingly, Barr et al. (2014)

reported that IPE has been less successful in the classroom disciplines of anatomy and physiology and that this was due to different requirements of teaching (Barr et al., 2014). However, this statement appears to be based on only one institution used as a case study (Canterbury Christ Church University, Canterbury, UK), which is also a non-medical school and does not utilize a dissection facility. The finding does not explain in any further detail the type of anatomy teaching and learning opportunities offered and thus should not be used as evidence against AIPE.

Context in the United Kingdom

In the UK and Ireland there are 40 medical schools that teach anatomy based on a published core syllabus (McHanwell et al., 2007). Anatomy is predominantly taught by dissection and with prosections (Heylings, 2002; Patel and Moxham, 2006) with a small number of medical schools having no access to human cadaveric material. The growth of technology-enhanced learning (TEL) has resulted in anatomy being embedded in a range of resources that students rate highly including interactive e-learning (Webb and Choi, 2014) and screencasts (Pickering, 2015) although it has been demonstrated by Davis et al. (2014) that students prefer human cadaveric dissection to TEL.

The General Medical Council (GMC) states in *Tomorrow's Doctors* that; "*The doctor as a professional should learn to work efficiently within a multiprofessional team"* (GMC, 2009, outcome 3, item 22). This is expanded on by the Centre for Advancement of Interprofessional Education (CAIPE) Guidelines for Interprofessional Education for Preregistration courses, which detail recommendations to those responsible for

commissioning and regulating IPE programs in the UK (CAIPE, 2002). In the UK it has been reported that between 1997 and 2012 two thirds of British universities offering health and social programs had an IPE component (Barr et al., 2014).

This paper reports on the use of AIPE in the United Kingdom and Ireland and on the experiences both of the students and teachers in AIPE courses. This study also investigates the use of AIPE in the United Kingdom and Ireland by asking the following research questions: (1) What is the uptake of AIPE in UK medical schools? (2) What are the details and variants of AIPE programs? and (3) What are the benefits and disadvantages of AIPE from student and staff perspectives?

METHODS

To answer the research questions this study employed a mixed methods approach using both qualitative and quantitative methods. The qualitative component involved free text responses to a survey and free text responses from in-course evaluation data and a focus group. The quantitative component involves survey and student evaluation data.

For the UK and Ireland survey this study was considered to be exempt from requiring ethical approval by the Research Governance Ethics Committee of Brighton and Sussex Medical School. For the case studies ethical approval was also not required as these are descriptive case studies using evaluation data collected as part of normal university processes.

Survey

Permission was obtained from the Council of the Anatomical Society to use the distribution list the Society holds for Heads of Anatomy at UK and Irish Institutions (n = 40). An online survey was designed by the research team and was set up using Survey Monkey (Survey Monkey, Palo Alto, CA). The survey (Appendix A) was piloted at the University of Southampton and the University of Sussex. Participants were asked to complete the survey within four weeks. Two email reminders were sent. The survey contained a mixture of 16 closed and open questions, and five questions that required a four point Likert scale (strongly agree, agree, disagree, and strongly disagree). A non-parametric Kruskal Wallis test was performed on the Likert scale responses to explore the relationship between the Likert scale response and uptake of AIPE. To test for validity a Cronbach's alpha test was performed on the Likert scale response items of the survey (Cronbach's alpha = 0.77). A non-parametric Kendall's tau B test was performed on the survey Likert Scale questions (Q12-16) to examine the relationship between the questions. The survey data were analyzed using SPSS statistical package, version 22, (SPSS Inc., Chicago, IL). The open questions were analyzed using thematic analysis by free node coding the text based on an approach by Silverman (2000).

Student Evaluation and Focus Group

Course evaluation data for each case study (University of Southampton and St George's University of London) was examined in detail for overarching trends. The focus group was scheduled for 45 minutes at Southampton General Hospital. The focus

group was guided by pre-determined open core questions. The focus group was recorded and transcribed verbatim. The transcript was then analyzed using a line by line coding and generation of codes into themes. This method was informed by a grounded theory approach (Charmaz, 2006).

Case Study 1. University of Southampton

To date the Centre for Learning Anatomical Sciences (CLAS) has contributed to four AIPE modules (Building the Human Body, Body and Society, Engineering Replacement Body Parts and Neuroanatomy for Advanced Nurse Practioners) and a summary of module information can be found in Table 1. Evaluation data were examined for each module and a focus group conducted with the Neuroanatomy Advanced Nurse Practioners.

The nature of AIPE has broadened significantly since its introduction in 2011 and the initiatives were designed to create synergies between disciplines – to generate new ways of thinking across subject areas, to stimulate the development of important transferrable skills for global employability. A number of key graduate attributes were included in the design of each module, and included aspects such as ethical leadership, reflective learning, communication and research and enquiry skills. Because of the diverse group of learners there was no curriculum mapping as such.

Building the Human Body.

In 2011 a team within CLAS responded to a University-wide initiative to offer a Curriculum Innovation Program (CIP) module that would be accessible to all students. Until this time, the anatomical sciences laboratory had predominantly been used by medical students with students studying physiotherapy and occupational therapy undertaking a few sessions. The Building the Human Body module (BHB) was offered to students who were in the second or third year of a degree program. For BHB only 20 places could be offered. Details of the BHB module can be found in Table 1.

Engineering Replacement Body Parts.

The Engineering Replacement Body Parts (ERBP) module was designed by the Faculty of Engineering and Environment in partnership with The Faculty of Medicine; it explores the potential use of stem cells, engineered tissues and implanted devices in medicine. Students also study how these technological and medical advances impact on the law and ethics of society. Further details of the ERBP modules can be found in Table 1.

Body and Society.

The Body and Society (BS) module was developed by the Faculty of Humanities and examines how the body has been perceived as a physical object and a social construction. The module examines the central role of the body in mediating social relations, and how people respond to the living and the dead body in culturally and historical ways.

Neuroanatomy and Advanced Nurse Practioners.

The neuroanatomy and advanced nurse practioner module (NANP) arose out of a National Health Service (NHS) training need. The roles of nurses in modern healthcare are becoming increasingly diverse as the NHS evolves to meet the growing patient demand. These roles include specialist nurses who focus on one area such as stoma care or tissue viability (similar to the role of a physician associate). The amount of anatomy studied by pre-registration nursing students is not sufficient for the role of an advanced nurse practioner. The NANP module covered: vasculature, cranial nerves, cerebral topography and cerebrospinal fluid pathways and involved both AIPE and near-peer teaching (NPT), further details can be found in Table 1.

Case Study 2. St. George's, University of London

Interprofessional education was adopted in 1996 with the Common Foundation Program (CFP) and later the IPE training ward (Reeves et al., 2002). Anatomy teaching formed part of a range of integrated learning activities, though different programs also pursued their own curricula outside the CFP. Unlike Case Study 1, the CFP curriculum was matched to the program requirements and the pathways mapped out for each degree program, being compulsory for all students. The CFP took place in the first term (semester) of year 1, and the cohort included students from the Bachelor of Medicine, Bachelor of Surgery (MBBS) and BSc Biomedical Sciences (the largest contingents), together with BSc Physiotherapy, BSc Nursing and BSc Therapeutic and Diagnostic Radiography. The MBBS students in the CFP included both graduates and undergraduates for this predated the introduction of the Graduate Entry Program in 2000 (McCrorie, 2001, Prideaux and McCrorie 2004). The CFP explored the concept of

the “Anatomy of the Physical Examination” through weekly lectures and practical sessions in the dissecting room (DR).

Anatomy was taught around a pre-dissected whole cadaver in groups of eight students with a demonstrator at each table. Students were assigned to a table and each group contained a mixture of students from different streams. The CFP ran for eight weeks and followed systems-based anatomy in the order: skeletal, muscular, peripheral nervous system, cardiovascular, respiratory, gastrointestinal/genitourinary and central nervous system. The CFP was assessed by 40 questions, in which students were asked to identify structures pinned in dissections, or marked on plastic models, bones or radiographs and in diagrams and photographs. This style of anatomy assessment is further detailed in Smith and McManus (2015) and Brenner et al. (2015).

In 2007, following a review and overhaul of the medical curriculum, the eight-week CFP was refined and expanded to a 12-week program, the Interprofessional Foundation Program (IFP), taking place in Semester 1. The extended program included sessions on the endocrine system, peripheral vasculature and autonomic nervous system, and had separate sessions for the genitourinary and gastrointestinal systems. All students on the IFP received a handbook that includes notes for their forthcoming anatomy practical sessions, images, useful websites and intranet sites, quizzes and suggestions for further study. The IFP is intended to give students of medicine, biomedical science and physiotherapy a basic grounding in topographical anatomy. St George’s operates a spiral curriculum (Harden, 1999), so after IFP, students will re-visit and study the

anatomy in greater depth with more emphasis on clinical and applied aspects. Medical and Biomedical Science students follow the same anatomy program throughout their first two years. Physiotherapists split off after semester one and follow their own musculoskeletal anatomy course.

As a result of the pressure of increasing student numbers and module evaluation feedback from staff and students, the BSc Nursing and Radiography students were split from the main group in 2006 to follow a separate, shortened version of the IFP. Subsequently, when nursing became an all-graduate course, the nursing students left IFP altogether to follow their own anatomy course. In 2012, the Radiography students were joined by Healthcare Science (HCS) students and follow a separate, seven-week anatomy course that has been written specifically to accommodate the learning needs and curriculum requirements of these three groups (HCS, Diagnostic Radiography and Therapeutic Radiography).

RESULTS

Survey

Thirteen UK and Irish institutions completed the survey (response rate 33%). The majority (n = 8, 62%) of responding institutions did not have an AIPE program. The five institutions that did have an AIPE program offered a total of 10 AIPE programs which involved: medicine, nursing, midwifery, science, speech therapy, language pathology, dental hygiene, physiotherapy, archeology, sociology, psychology, chemistry and anthropology. There was variability in when AIPE programs were delivered, with

medical students being involved predominantly in the early years (years 1 and 2) of the course whereas Bachelor of Science degree programs tended to use AIPE in later years. The number of students involved in AIPE programs also varied considerably from 10 to 600 students.

Delivery of AIPE occurred predominantly via lectures and tutorials with 80% of AIPE anatomy programs utilizing laboratory sessions, frequently with a range of prosections. The hours dedicated to AIPE sessions ranged from 6 hours to 60 hours with the average being 28.5 hours. The majority of AIPE programs had a summative assessment component. Half of the programs utilized multiple choice questions (MCQ) as one of their assessment methods; the other assessment methods included: viva voce examinations, practical laboratory examinations (spotters), short notes and essays as well as portfolios and blogs.

Examining the free text questions in the survey, when asked 'What interests you or puts you off running anatomy interprofessional education?' six commented on the opportunity for interdisciplinary interaction as a positive. Other positive themes focused on the benefits for students, for example '*is often productive in motivating and supporting students*' or '*making the most of a valuable resource (anatomy laboratory)*'. The two main negative themes that emerged were the need to "'*dumb down' anatomy to cater for the needs of other trainee healthcare professions"* and "*the extra work-load*", although, the ability to save time and streamline teaching was also mentioned as a

positive. When asked ‘Would you consider running an IPE course in the future?’ 62% would. This included four institutions that are not currently running AIPE.

The results of the Likert scale questions (Appendix A) demonstrate the perception that AIPE can occur successfully (86% either strongly agree or agree) (Figure 1, Q12). When considering if AIPE did not work because of the difference in knowledge required, a broader spread was seen, with 72% strongly disagreeing or disagreeing and 28% either strongly agreeing or agreeing (Figure 1, Q13). There was a significant association between those who were currently delivering AIPE agreeing that AIPE did not work because of the knowledge differences and (P = 0.011). The majority (93%) strongly agreed or agreed that AIPE fosters many additional benefits. The response to ‘IPE works better in other areas of medical and health care education’ was split (Figure 1, Q15). The response to ‘The idea of IPE is a good one it is just the logistics that doesn’t work’ was supported by 64%. Refer to Figure 2 for quantitative results. A non-parametric Kendall’s tau B test on questions 12-16 revealed associations between the positive elements of Q 12 (IPE can successfully occur in anatomy) and 14 (IPE in anatomy fosters many additional benefits) (P = 0.019) but also between Q12 and Q15 (IPE works better in other areas of medical and health care education) (P = 0.025) and Q 13 (IPE does not work in anatomy because of the different levels of knowledge required) and Q14 (P = 0.007).

Case Study 1 from the University of Southampton

Building the Human Body (BHB). Fourteen students completed the module and the anatomy spotter examination results ranged between 63%-97%. The assignment marks ranged between 61% and 85%. The overall module evaluation on a Five point Likert scale was 4.86/5. Feedback for the module was universally positive. In particular, written comments focused on being able to see real human specimens, the enthusiasm of the lecturers, the personal, flexible and innovative nature of the teaching, and the pitch of anatomical content at an appropriate level. All members of the teaching team were nominated for an innovative teacher award at the Excellence in Teaching Awards.

The Body and Society. The anatomy feedback from this module was limited due to University processes. Overall the module was rated highly 4.37 on a Five point Likert scale with positive supporting comments such as, *'The opportunity to visit the anatomy lab was unique and fascinating'*.

Engineering Replacement Body Parts (ERBP). Seventeen students enrolled in the module from disciplines such as zoology, biology, electrical engineering, biomedical sciences, biochemistry and psychology. The overall rating for the anatomy component on a Five point Likert scale within this module was 4.85/5. Seventy-one percent of students rated the session 5/5 for enjoyment with all of them rating the content as highly relevant to the module learning outcomes. Eighty-six percent of the students would like to have more opportunities in the future to use the anatomical sciences laboratory before they graduate. Fifty percent of the students commented that seeing the implant *in situ* was the best aspect of the anatomy component.

Neuroanatomy and Advanced Nurse Practioners (NANP). All six of the ANPs attended the session and completed the feedback form. The average ratings for the overall quality of the session, enjoyment of the session, clarity of the explanation and relevance of the material for clinical practice were all 5.0/5.0. The average rating for the importance of clinical anatomy education for specialist nurses was 4.8 out of 5.0. All of the responders agreed that the depth of knowledge was appropriate for their stage of training, their practice would benefit from more detailed neuroanatomy teaching, and that all nurses should have access to anatomy demonstrations.

The focus group was also attended by all six of the advanced nurse practitioners. Thematic analysis identified three major topics: supporting their clinical practice, their lack of formal anatomy teaching, and the experience of learning anatomy using cadaveric specimens. *Supporting clinical practice*: the nurses feel that neuroanatomy teaching would be most effective if they could relate it to patients and conditions that they have seen. This finding is supported in the following quote "*you get a hold of it [neuroanatomy teaching] quicker if you have a context to put it in*". When asked "*what sort of topics would you benefit from?"* they responded "*our bread and butter stuff, like sub-arach* [noid hemorrhages]" and "*in the context of the case history it would be really useful*". *Lack of adequate basic science teaching:* the group was centered on how the nurses had not received sufficient anatomy teaching during their undergraduate training. There was also the issue of how not all nurses will require extra basic science training. This is highlighted by this individual: "*they kinda say you should know this already but*

in reality you've never been taught it or you were taught it so long ago and never applied it". *Learning using cadaveric specimens:* anatomy education for these nurses was classroom based and thus the nurses had no previous exposure to working with cadaveric prosections. The nurses had previous exposure to death on the wards. When entering the dissecting room, the most common issue was the smell of the embalming fluid. Another issue was dealing with the humanity of the specimens, however this was a mixed issue with some nurses being unnerved by the fact that the specimens were once humans with others feeling that the specimens were easier to handle than corpses on the wards because they had never spoken to, or engaged with them. One positive feeling towards being in the dissecting room was that using the specimens made it easier to visualize the anatomy and aid with memory formation. These experiences are highlighted in the following quotes: "*I was a little bit apprehensive* […] *cos I knew it was real and there was still hair on some*", "*I remembered quite a lot from it because I could see it right in front of me*", "*I was a bit more detached from it cos I hadn't spoken to those ones*" and "*I struggled with the smell quite frankly*".

Case Study 2 from St George's University London

Interprofessional Foundation Program (IFP). At the end of the IFP, students gave feedback on their experience in the DR, the quality of their teaching, and their assessment of the value of interprofessional learning. Four questions were asked: (1) "*The DR provided a useful environment for learning the structure and function of the human body*"; (2) "On a Five point Likert scale *please rate the quality of the DR teaching*"; (3) "*Multi-professional healthcare education is valuable*"; (4) "*The IFP has*

assisted me in understanding the roles of other healthcare professions". Sixty-three percent strongly agreed that the DR provided a useful environment for learning. When examining the quality of teaching, the quality of teaching was more highly rated by the radiography and physiotherapy group (Figure 3). In considering the general IFP feedback, 93% of radiography and physiotherapy students, 74% of medical students and 83% of biomedical sciences students either agreed or strongly agreed that multi-professional healthcare education was valuable (Figure 3). When asked the degree to which IFP had assisted them in understanding the roles of other healthcare professions the radiography and physiotherapy students again responded positively (83% agreeing or strongly agree) (Figure 3). Refer to Figure 4 for quantitative results.

The vast majority of comments by students were positive, one biomedical science student commented on the necessity for the demonstrators to be reminded that they are teaching a group of mixed students:

"*Some demonstrators seem unaware of which course they are teaching and so will often expect answers from us that only medical students would know."*

The sheer size of the cohort can also present problems, and several students commented on the noise in the crowded DR and the difficulty of hearing the demonstrators, e.g.: "*I often could not hear what the demonstrators were saying as many would speak quietly or mumble and often my group was so big that I was quite far away from whoever was teaching*".

The necessity to provide 21 demonstrators every week for the IFP inevitably brings its own problems, and several students commented on the variability of the standard of teaching - "*Too much variation from demonstrator to demonstrator. Some were unhelpful and some were perfect for the role. Need consistency in teaching*" is a typical comment, though one student was more direct: "*Varied hugely between the instructor. Either they were fantastic or useless.*"

DISCUSSION

In bringing together the quantitative and qualitative components of the survey and case studies the following three themes emerged: experience and readiness for AIPE, implications for teaching anatomy in an IPE course and demand for AIPE modules.

Experience and Readiness for Anatomy Interprofessional Education

Using the DR as an environment for AIPE is major benefit for students and was recognized in both the survey and case studies. Utilizing human specimens is important because it promotes a deep approach to learning (Smith and Mathias, 2010; Smith et al., 2014). While some students such as the ANP nurses did report problems with the dissecting room, these were not so much with the issue of dealing with cadavers but more with the issue of smell, a finding that has also been reported by Mitchell et al. (2004). Having such a unique experience to work on human cadavers could offer an opportunity to strengthen some of the GRPI elements, especially values, ethics, communication and team working as detailed by Rubin and Beckhard (1972) and Thistlewaite (2015).

For each case study there were no negative attitudes towards AIPE, as found in Morison et al. (2004) and Coster et al. (2008). Given this study was over ten years ago it is likely that attitudes have changed. Other studies (Hamilton et al., 2008; Herrmann et al., 2015) have shown that different professional groups can be more skeptical about the benefits of IPE, however, for each study the professional group most skeptical is different, possibly reflecting that local curriculum influences are more responsible than global perceptions from one profession.

Implications for teaching anatomy in an IPE course

Throughout the survey and the case studies student feedback is overwhelmingly positive and staff are committed to the idea of IPE, even though increasing student numbers make the practicalities challenging and it may be these practicalities that hinder future uptake of AIPE. In Case Study 2 the curriculum of each program required carefully planning, scheduling and organization which played a large part in the success of the IFP. In some respects it might be argued that the IFP in Case Study 2 has been a victim of its own success with student numbers becoming so large that scheduling and room allocation have become increasingly difficult. For example, lecture theatres have to be linked by video screens as there is not the capacity for all IFP students in any one lecture theatre. Availability of anatomy resources is also a limiting factor. As highlighted by Kirch and Ast (2015), physical spaces and finances do play a part in IPE and have to be considered from the start.

Demand for Interdisciplinary Modules Containing Anatomy Content

Interprofessional education has been well defined within the context of the medical and healthcare professions but much less defined in the non-healthcare professions. Case Study 1 highlights that there is demand and a passion for AIPE outside of the healthcare setting. Anatomists can often forget that anatomy is of interest to non-medics and even non-scientists. The interests of these students lie much less with the factual burden of anatomical detail but surround wider biological processes such as evolution, human development, sexual dimorphism, social categorization, human aesthetics and bioengineering.

CONCLUSIONS

Studies by Berwick et al. (2008) and Thistlewaite (2015) reflect that in the United States IPE is being evaluated with the aim of improving patient experience of care, improving the health of the population and reducing the *per capita* cost of healthcare. Other studies (Mitchell et al., 2004; Herrmann et al., 2015,) report on anatomy in the context of medical and healthcare training. It could be speculated that the values of IPE being focused on the healthcare profession is a narrow perspective, the values of IPE stem from shared learning, improved team-work and communication. These skills are valuable to all and in the case of non-healthcare AIPE can offer new ways of thinking - graduate employability, ethical leadership, reflective learning, and communication research and enquiry skills. Offering AIPE in a non-medical or healthcare program can add a ‘wow’ factor to enhance recruitment and vary the learning experiences. The results from the survey highlight that 65% either are or would consider setting up a new

AIPE program. In summary AIPE in anatomy can bring about many positives and Table 2 provides a summary of the pros and cons of AIPE.

Anatomy interprofessional education and near-peer teaching (NPT) offer many opportunities for both the student teacher and the student. The case study with the ANP nurses reflects the positive findings of Shields (2015) in that NPT can be part of AIPE. Further studies are needed to ascertain the optimum congruence level of the NPT and AIPE as described by Hall et al. (2014).

Within the UK and Ireland context AIPE is effective at providing anatomy education as well as fostering many other skills and attitudes. The future of anatomy education lies with embracing a new community of learners just as much as it does on providing core knowledge of the human body for future doctors.

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LEGENDS

Table 1. Overview of Case Studies

Table 2. Summary Pros and Cons of IPE in Anatomy

Figure 1. Likert scale responses to Questions 12,13 and 15

Figure 2. UK and Ireland Heads of Anatomy responses on a 4 point Likert scale (1=strongly agree, 2 agree, 3 disagree, 4 strongly disagree); mean, standard deviation (±SD).

Figure 3. Likert scale responses from Case Study 2 to the following questions ‘The DR provided a useful environment for learning the structure and function of the human body, ‘Please rate the quality of the DR teaching’, ‘Multi-professional healthcare education is valuable’, ‘The IFP has helped me in understanding the roles of other healthcare professions.

Figure 4. Student responses from Case Study 2. St. George’s, University of London on a 5 point Likert scale (1=strongly disagree, 2 disagree, 3 neither disagree or agree, 4 agree, 5 strongly agree); mean, standard deviation (±SD).

Table 1. Overview of Case Studies

Module Name	Module Overview	Faculty	Hours	Intake of Students	Anatomy Assessment
Building the Human Body	The module explores the developmental and evolutionary processes responsible for adult human anatomy and investigates the structure of the human body. Sessions includes lectures and DR practical sessions with prosections.	Medicine (CLAS)	Contact hours 43 Non-contact hours 107 Anatomy hours 37	25	Anatomy spotter (25%) Assignment (60%) Peer assessed presentation (15%)
Body and Society	The module examines how the body has been perceived as a physical object and a social construction. It looks at the central role of the body in mediating social relations. Sessions include DR practical sessions with prosections.	Humanities	Contact hours 32 Non-contact hours 118 Anatomy hours 9	50	Anatomy MCQ (10%) Portfolio Blog
Engineering replacement Body parts	The module explores the potential of stem cells, engineered tissues and implanted devices in medicine. Sessions include DR practical sessions with prosections.	Medicine/ Engineering and Environment	Contact hours 30 Non-contact hours 120 Anatomy hours 3	17	Attendance only
ANP	The module provides an overview of applied neuroanatomy. Sessions include DR practical sessions with prosections.	Faculty of Health Sciences	Contact hours 30 Anatomy hours 6	4	Not assessed
IFP APE	The module provides an overview of the human body, mainly systems-based, over 12 weeks. Sessions include lectures and DR practical sessions with prosections.	IMBE	Contact hours 55 hours Plus Anatomy hours 25 for MBBS, Biomedical Science, Physiotherapy and16 hours for Health Care Science, Radiography	584	Formative Spotter for MBBS and Biomedical Science students Summative, Written, and SBA for physiotherapy, healthcare science, and radiography

					students

Key for Table 1:

APE, Anatomy of the Physical Examination

ANP, Advanced Nurse Practioner

CLAS, Centre for Learning Anatomical Sciences

DR, Dissecting Room

IFP, Interprofessional Foundation Program

IMBE, Institute of Medical and Biomedical Sciences Education

MBBS, Bachelor of Medicine Bachelor of Surgery

MCQ, Multiple Choice Questions

SBA, Single Best Answer

Table 2. Summary Pros and Cons of Anatomy Interprofessional Education

Pros	Cons
Engaging for students	Difficult logistics of timetables
Enables Touch Mediated perception if involves cadaveric material	May involve 'dumbing' down of anatomy content to suit some groups
Allows further development of teachers	Time consuming to prepare
Can enhance participation of students	Burden of assessment administration within faculty
Fosters Interprofessional working of teachers	Difficulty with new assessment methods that are unfamiliar in anatomy (e.g., blogs, peer assessments, portfolios etc.,)
Fosters interest in anatomy as a discipline	Often done through good will rather than as enterprise venture? Financial sustainability can be an issue.
Increases use of dissection room facility: Resource – future proofing of anatomy laboratories?	Teaching staff tend by default to teach as though all students are medics. Ned to be constantly reminded that groups are mixed.
Explores anatomy from alternative perspectives.	Important that teaching is pitched at a level that is appropriate to the students' learning needs.
Flexible assessment methods	
Receives overwhelmingly positive feedback	

Figure 2. UK and Ireland Heads of Anatomy responses on a 4 point Likert scale (1=strongly agree, 2 agree, 3 disagree, 4 strongly disagree); mean, standard deviation (±SD).

Question	N	Mean	±SD
12. IPE can successfully occur in Anatomy	13	1.6	0.7
13. IPE does not work in anatomy because of the different levels of knowledge required	13	2.7	0.9
14. IPE in anatomy fosters many additional benefits	13	1.5	0.6
15. IPE works better in other areas of Medical and Health care education	13	2.4	0.8
16. The idea of IPE is a good one it is just the logistics that doesn't work	13	2.2	0.7

Figure 4. Student responses from Case Study 2. St. George's, University of London on a 5 point Likert scale (1=strongly disagree, 2 disagree, 3 neither disagree or agree, 4 agree, 5 strongly agree); mean, standard deviation (±SD).

Question	Student Group	N	Mean	±SD
The DR provided a useful environment for learning the structure and function of the human body	MBBS	147	4.4	±0.8
	Radiography	156	4.6	±0.8
	Biomedical Science	48	4.5	±0.6
Please rate the quality of the DR teaching	MBBS	147	4.1	±0.7
	Radiography	156	4.5	±0.3
	Biomedical Science	48	4.1	±0.5
Multi-professional healthcare education is valuable	MBBS	147	3.6	±0.9
	Radiography	156	4.3	±0.7
	Biomedical Science	48	4.1	±0.7
The IFP has assisted me in understanding the roles of other healthcare professions	MBBS	147	3.7	±1.0
	Radiography	156	4.1	±0.8
	Biomedical Science	48	5.2	±1.0

APPENDIX A.

Questions asked in the AIPE Survey

1. Name of Institution

2. Do you run a interprofessional education (IPE) program that involves anatomy teaching? If no please move to question 9

3. What programs are involved in the IPE

4. In what year of their respective programs does the IPE occur?

5. What methods of delivery does the IPE anatomy program utilize?

6. Approximately how many contact hours does the IPE anatomy program have?

7. What is the summative assessment method utilized?

8. How did you define the content of what was required for this program

9. Have you previously run an IPE in anatomy course? If so please say why you no longer run it

10. Would you consider running an IPE course in the future

11. What interests you or puts you off IPE in Anatomy

Using 1-4 Likert Scale

12. IPE can successfully occur in Anatomy

13. IPE does not work in anatomy because of the different levels of knowledge required

14. IPE in anatomy fosters many additional benefits

15. IPE works better in other areas of Medical and Health care education

16. The idea of IPE is a good one it is just the logistics that doesn't work